CAREER PATHS OF POWER FIVE ATHLETIC DIRECTORS: A SOCIAL NETWORK ANALYSIS

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ABSTRACT

Grace E. Dickman: Career paths of power five athletic directors: A social network analysis
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The purpose of this study is to explore the career paths of Division I Power Five athletic directors. Using social network analysis, this research builds a network of institutions of higher learning that are connected by career position changes of current Power Five athletic directors. The goals of the study are to investigate whether there are patterns in career paths, and if certain institutions are hubs and authorities for athletic directors. The research suggested that patterns in career paths have changed for athletic directors, and paths differ based on gender. The hubs in the network propelled athletic directors into high ranking positions at their next institution, and authorities hired athletic directors in high positions. Influencers did not have a high volume of hires or athletic directors leaving for other jobs, but when they did, it was usually either at the senior associate athletic director level or athletic director level.

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CHAPTER 1

1.1 INTRODUCTION

An athletic director (AD) at an NCAA member institution is, in many ways, comparable to a CEO in their responsibilities and concerns (Hardin, Cooper & Huffman, 2013). For CEOs, the study of corporate networks and their functions is essential to understanding career pathways into senior management positions (Useem & Karabel, 1986). Given this similarity between the esteemed positions of ADs and senior management positions, we could assume that networking is an important factor in achieving such status. According to research by Young (1990), surveys conducted amongst Division I and Division III administrators showed that "mentoring relationships and networking are perceived as important" (Young, 1990, p. 72). Within this same research, 73.7% of administrators noted that recommendations from network contacts held a great deal of weight in the hiring process. In order to understand career paths of athletic directors, it is important to analyze their networks.

The study of networks is deeply rooted in sociology, dating back to Plato as he tried to navigate the problem of social order (Borgatti, Mehra, Brass & Labianca, 2009). According to Scott and Carrington (2014), sociologists began to use the idea of social networks to describe characteristics of social structures in the early 1930's. Networks are a versatile representation of relationships, structure and flow of information. Airline maps (Colizza, Barrat, Bathelemy & Vespignani, 2006), Facebook (Farahbakhsh, Cuevas, Ortiz, Han & Crespi, 2015) and food webs (Krause, Frank, Mason, Ulanowicz & Taylor, 2003) are all examples of networks. Networks are

used to describe structures in the fields of biology, physics, epidemiology, economics, academics, and sports. The metrics in a network have implications for how individuals within the network function and how the network functions as a whole (Hanneman & Riddle, 2014).

Utilizing network analysis, Milgram (1967) explored the small world phenomenon. The premise of the experiment was grounded in the question: "Starting with any two people in the world, what is the probability that they will know each other" (Milgram, 1967, p. 62). He posits that there are two philosophical views regarding the phenomenon. The first is that any two people, regardless of location, can be linked by a small number of connections. Conversely, the second view theorizes there are inherent "unbridgeable gaps" (Milgram, 1967, p. 63) which prevent groups of people from ever having connections. He completed the experiment by counting how many intermediate steps it took to get a letter from a randomly chosen person in the United States to another randomly chosen person as the target. He found that the median number of intermediates was five, and therefore, six degrees of separation between the source and target. We build on this research by exploring whether connections, using hiring patterns, between intercollegiate institutions adheres to this phenomenon.

Social hierarchies and social capital are a crucial part of societal structures that affect how a person's personal network is formed. Social capital is the sum of resources within a person's social network that can be accessed or mobilized through ties in the network (Lin, 2001). It facilitates actions within the network and is productive; social capital accomplishes things that, in its absence, normally could not have been done (Coleman, 1988). Social capital provides people with an advantage in achieving their goals (Burt, 2000).

An important distinction is that access to social capital refers to its potential energy, whereas the mobilization of social capital is its kinetic energy, or use within the hierarchy. The

use of one's connections in a job-search is an example of the mobilization of social capital, but it's important to note that network structure has an effect on fundamental access to the capital (Lin, 2008).

Social networks tend to be built around a specific focus, which is "a social, psychological, legal, or physical entity which joint activities are organized" (Feld, 1981, p. 1016). The social capital that ADs built at their previous institutions could be used as leverage to move into future job positions within the entity of intercollegiate athletics. This narrow focus allows for a denser personal network (Feld, 1981), which increases the ability for administrators to use their social capital.

Burris (2004) examined the prestige of academic departments as a form of social capital, which can be used to further a person's career and give them access to jobs. In the world of academia, the prestige of where someone gets their PhD is correlated to the prestige of the institution where they will get their first job (Burris, 2004). Athletics have been incorporated into higher education since the middle of the 19th century and have been an integral part of the identity of higher education institutions (Brand, 2006). Since NCAA members are higher education institutions, the analysis of academic hierarchies can be used to inform hypotheses about hierarchies and movement in intercollegiate athletics. The career paths of ADs have been studied extensively, as have the use of social networks in various fields; though the career paths of ADs have not yet been studied through the use of social networks.

1.2 STATEMENT OF PUPOSE

The purpose of this research was to build and analyze networks based on the career paths of current power five athletic directors in order to identify patterns in career paths and hiring patterns of the institutions. Through network analysis, we were able to identify hubs and

authorities which produce the greatest number of ADs in Division I athletics and analyze the importance of connections within the upper echelon of intercollegiate athletics. Another outcome of this research was determining the average number of jobs an AD holds during their career.

1.3 RESEARCH QUESTIONS

1. What is the career path of current Division I Power Five athletic directors?
2. Which institutions are hubs and authorities for current athletic directors?
3. Which institutions are considered most influential in the network?

1.4 DEFINITION OF TERMS

Power Five: Power Five refers to the collection of institutions in the Atlantic Coast Conference, Big XII, Big Ten, Pacific-12, and Southeastern Conference, along with Notre Dame.

Vertex/Node: Each vertex, or node, represents a university or organization that a current Division I Power Five athletic director has worked at.

Edge: An edge (u, v) represents a directional career change from one university to another for a specified athletic director (j).

In-Degree (i): The in-degree of each individual vertex i is how many current athletic directors have been hired by institution i.

Out-Degree (i): The out-degree of each vertex i is how many current athletic directors have moved on from a position at institution i.

Betweenness Centrality: The betweenness centrality measures the extent to which a vertex lies on paths between other vertices. In the context of our study, this measured how much of a stepping stone an institution is for athletic directors in their careers.

Let $n_{st}^{i} = 1$ if vertex *i* lies on the geodesic path from *s* to *t* and 0 if it does not or there is no existing path. The betweenness centrality x_i is given by

$$x_i = \sum_{st} n_{st}^{i}.$$

Modularity: Modularity measures the strength of separation in a network into modules, also known as communities. High modularity values denote dense connections within the communities, but sparse connections between distinct communities. It's the fraction of edges within the community minus the expected fraction of edges if they were distributed at random.

Strongly Connected Components: A graph is strongly connected if there is a path between all pairs of vertices. Strongly connected components are subgraphs that are maximally connected.

PageRank Centrality: A weighted degree centrality that has a feedback loop. It captures how effectively a vertex takes advantage of its network contacts/connections. In the context of this network, it shows how effectively the institution moves ADs through it, as well as its connections to influential schools in the network. These institutions are considered well connected.

Hubs and Authorities: Authorities are institutions that hire from hubs, and hubs are schools that send ADs to jobs at authorities. These jobs are at higher level positions.

1.5 LIMITATIONS

This study was limited by the availability of information on the complete career paths of current Power Five athletic directors on university athletics' websites. It was also limited by the reliability and accuracy of the information in the publicly available biographies of each athletic director. Another limitation is that this study is not generalizable to all Division I schools, or across the NCAA as a whole.

1.6 ASSUMPTIONS

In this study, it is assumed that the information on the athletics' web pages is accurate and complete.

CHAPTER 2: LITERATURE REVIEW

2.1 CAREER PATHS OF COLLEGIATE ATHLETIC DIRECTORS

Historical career backgrounds of athletic directors helped identify the starting points for the network – more specifically, where to mark the beginning of their career. Williams and Miller (1983) studied the career preparation patterns of 320 ADs across the Division I, II, III levels, AIAW and NAIA. Many ADs had professional degrees, with 88% having a master's and about 5% having doctorates. About 10 years later, Fitzgerald and Sagaria (1994) surveyed 200 ADs across the three NCAA divisions and found 96% earned a bachelor's degree, 85% earned a master's degree and 21.5% earned a doctorate degree. Within the course of a decade, the educational background of ADs was changing.

Williams and Miller (1983) reported what background experiences ADs identified as being beneficial; benefit ratings were on a 7-point scale. Coaching at the college level was rated as 6.36/7 and 94% of ADs had a background in it. An overwhelming number of ADs were student-athletes (88%) and found it to be beneficial (5.8). As far as having previous administrative positions, 31.6% of ADs had internship training in athletic administration and rated it as a 5.68; 40.5% were assistant or associate directors of a male athletic program and rated it as a 5.62; and 37.5% were assistant or associate directors of a female athletic program and rated it as a 5.59 (Williams & Miller, 1983). Fitzgerald and Sagaria (1994) found that 80% of the ADs that they surveyed were collegiate student-athletes, 65% coached a college sport, and only 39.5% were an associate or assistant athletic director prior to being an AD. They posited that the

normal career path trajectory of a collegiate AD went from a student-athlete, to a high school coach, to a college coach, to an associate or assistant director, and then onto being an AD. The study affirmed that at the time, being a student-athlete was primarily the normative start to an AD's career path.

The landscape of collegiate athletics has changed dramatically since these seminal AD-career path studies were published (Hardin et al., 2013). Hardin et al. (2013) updated this research by surveying 99 Division I ADs to find what helped them progress along their career paths. On average, these ADs had a total of 10.4 years as an AD at any institution, but more importantly, an average of 10.7 total years in any position at their current institution. They found that almost 83% of ADs had master's degrees and 18% had doctorate degrees. This newer research also found that only 42% of Division I ADs were college coaches. On the other hand, 25% were graduate assistants, and 25%, 22% and 19% were intercollegiate administrators within development, marketing and business management, respectively. It was common to start "out as a graduate assistant and eventually work up to an assistant or associate AD" and that movement from school to school is associated with "the climb from entry level to middle management to senior staff" (Hardin et al., 2013, pp. 68). Before they were ADs, 66% were either an assistant or an associate AD. This research saw a shift where ADs had more business experience than in years past. Although these two studies reveal statistics about the demographics of ADs and what their career backgrounds were, they do not look at it through the lens of SNA.

Diving even deeper into the analysis of the backgrounds of athletic administrators, Lumpkin, Achen and Hyland (2015) found significant differences between the backgrounds of top administrators, excluding athletic directors, across divisions and gender. Their findings paralleled the research done by Hardin et al. (2013) who reviewed administrators within all

NCAA member institutions and recorded their educational and employment backgrounds as recorded within athletic department website bios. Some of the most notable results were that 9% of Division I top administrators held a doctorate degree, and female administrators in Division I were more likely to hold a master's degree than their male counterparts. They also found statistics on years in current position, a breakdown of degree fields, applicable coaching background, and a breakdown of the departments that the two separate genders were in. They suggest that aspiring administrators should have a business background and at least a master's degree; females specifically should gain experience in external operations while pursuing their undergraduate degree. Still, neither the career paths of ADs nor administrators in general have been studied using SNA.

In 2017, only 35 of the 351 Division I ADs were female (Smith, 2017). In the research performed by Hardin et al. (2013), only 11% of respondents were female. Women constitute a small percentage of the athletic director population, and have differences in their backgrounds as compared to their male counterparts. Taylor and Hardin (2016) surveyed 10 female Division I athletic directors to study their experiences, challenges and career paths. Disproportionate to populations from other studies, 90% of the female ADs were student-athletes and 90% were college coaches. Similar to the findings from Hardin et al. (2013), these women held their current position as athletic director for 9.3 years on average and 80% held a master's degree (Taylor & Hardin, 2016). Applying SNA to look at the career paths of female athletic directors may uncover a career patterns within the population that previous studies have not observed.

2.2 SOCIAL NETWORK ANALYSIS IN SPORT

As previously mentioned, social network analysis (SNA) is a cross disciplinary analysis tool that allows researchers to investigate relationships between agents. Research methods and

theories from other fields have been applied to sport because it is a newer area of study. So far, SNA has been an effective way to study social patterns in sport (Wäsche, Dickson, Woll & Brandes, 2017). It has been utilized to explore interdisciplinarity in sport management research (Quatman & Chelladurai, 2008a; Quatman & Chelladurai, 2008b; Love & Andrew, 2012; Hambrick, 2017), sports communication and social media (Clavio, Burch & Frederick, 2012; Hambrick, 2012; Hambrick & Sanderson, 2013; Hambrick & Pegoraro, 2014), and the analysis of team sports (Lusher, Robins & Kremer, 2010; Fewell, Armbruster, Ingraham, Petersen & Waters, 2012; Oh, Keshri & Iyengar, 2015). Despite the recent growth in the application of SNA to the study of sport, it has yet to be applied to studying the networks of power five ADs.

Quatman and Chelladurai (2008a) posited that SNA and the study of sport management would work well together because both are interdisciplinary. They suggested that when using SNA, researchers should dive deep into the how and why of the relationships that are shown in the network. Quatman and Chelladurai (2008b) were the first to apply an SNA lense to sport management. They examined the evolution and then current state of a collaboration network within the field. Their findings showed an increase in published research, along with trends implicating an increase in collaboration within the field. An expansion on this research was performed by Love and Andrew (2012), in which they explored the collaboration networks in sport management and the sociology of sport. They found that there was a continued increase in collaboration within sport management journals, but a relatively small amount of change within sociology of sport publications. Hambrick (2017) added more to these findings by studying the evolution of the sport communication field based on the number of researchers, publications, collaborations, number of researchers collaborating on one paper, and research area. They also found an increase in publications and collaborations, but a decrease in the density of the

networks as more and more researchers entered the field. This use of SNA allowed the author to make suggestions and provide implications for the advancement of research within sport communication and sport management. Still, no researcher has yet to implement SNA in exploring the career paths of Power Five intercollegiate ADs.

Social media tools such as Facebook and Twitter are social networks that are built to disseminate and share information through a digital platform. Naturally, network analysis can be used to dissect relationships within these platforms (Stieglitz, Dang-Xuan, Bruns, & Neuberger, 2014; Fan & Gordon, 2014). One of the early studies looking at Twitter as a platform to spread sports information was performed by Hambrick (2012). Specifically, it investigated how two sports events were promoted on Twitter with SNA. Relationships within the social network were defined by followers. They found that early supporters helped popularize the events' pages through their followers, concluding that sports organizers could and should use Twitter to leverage their events. Building off of this, Hambrick and Sanderson (2013) used relationships between sports journalists on Twitter to compose a social network during the Penn State football scandal. They explored the evolution of the interactions between the journalists from the start of the scandal until 15 days post-news break, and found who the most prominent journalists were.

Instead of solely examining account followers to identify Twitter networks, researchers began to incorporate the role that hashtags may play in forming communities on the platform. Clavio, Burch and Frederick (2012) used SNA to build a network of the Twitter community for a Big Ten football team. The goal of the study was to determine if there was an underlying social network or networks in the subgroup of a team's Twitter followers. They used team specific hashtags to identify fans, and then followed those fans through the course of the season. The results indicated that there was, in fact, a social network within the subset of users following the

team. Hambrick and Pegoraro (2014) also used SNA and word-of-mouth to look at the use of hashtags on Twitter during the 2014 Sochi Winter Olympic Games. They examined how communities formed during the Olympics based on users tweeting with three distinct hashtags, and how they used these communities to discuss the games. Their results showed the speed of information dissemination via electronic word of mouth, as well as how social networks provided marketing opportunities for companies to spread their message. Although these studies showed how SNA illustrated communities and mapped the spread of information in the digital sports world, they did not apply this methodology to studying career paths of ADs.

Networks have also been used to analyze the behavior and function of sports teams. Lusher, Robins and Kremer (2010) were the first to write a guide on how to possibly apply SNA to team sports. They outlined SNA as a tool, hypothesized how it would further research, gave insight on how to collect data, and offered other tools that a researcher would need to study sports through a network analysis lens. A few years later, researchers began to apply SNA to team sports, and in-game outcomes and predictions. Fewell et. al (2012) used graphs to describe the offensive flow for an NBA team, showing which position groups received passes the most, and which outcomes happened most often. Oh, Keshri & Iyengar (2015) built off of the initial research done by Fewell et. al (2012) and combined it with other probability research, including the idea of using a possession-based Markov model from Shirley (2007) and Štrumbelj & Vračar (2012). Instead of looking at the flow of just the basketball through the course of an offensive possession, they predicted NBA game results based on specific player lineup combinations. They used probabilistic graphs to forecast who would pass to whom, and the possible outcomes of each event. These three studies are other examples of the applicability of SNA and graph

theory to sport. This paper will use SNA and graph theory to examine career path networks, though, not as a predictive modeling tool.

2.3 CONCLUSION

Researchers have been studying career paths of athletic directors for more than 35 years, with extensive research analyzing demographics and background patterns. Social network analysis has been used in a plethora of fields and recently, has seen an increased use in sports. However, researchers have yet to study the career paths of athletic directors, specifically Power Five ADs, using social network analysis as a method for exploration. In this paper, SNA is used to investigate patterns in the career paths of Power Five ADs, allowing for new visualizations of the collegiate athletics community and metrics measuring their careers.

CHAPTER 3: METHODS

3.1 METHODOLOGY

A network's metrics can show the strength of relationships, where communities are in the network, who or what is important, and additional types of connections. The main components that make up networks are vertices, or nodes, which are the points in the network, and edges which are the lines that connect the vertices (Newman, 2010). Some researchers are interested in what the vertices and edges represent and some are interested in the relationships between them. The four typologies of ties that researchers study in SNA are similarities, social relations, interactions and flows. Similarities focus on location, membership and attribute; social relations focus on kinship, affective, cognitive and other types of relationships; interactions focus on the action between nodes that establishes the connection; and flows focus on the spread of information, beliefs, personnel or resources (Borgatti et al., 2009).

There are different types of networks based on the kinds of edges that are used to describe the connection between vertices. The first two are undirected and directed networks. In undirected networks, the edges do not distinguish the direction of the connection between vertices. Conversely, edges in directed networks define the direction of the connection between vertices (Newman, 2010). Undirected networks have symmetrical connections, while directed networks could have asymmetrical connections (Hanneman & Riddle, 2014). In directed networks the direction of the connection matters, and gives context to relationships between vertices.

Edges in networks can not only be undirected or directed, but also unweighted or weighted. Edges that are unweighted imply that the connections have the same value. Weighted edges imply that each connection has a distinct value (Newman, 2010). For example, an edge can be weighted by a probability or a linear equation. In a weighted network, the "statistical properties of weights indicate non-trivial correlations" (Barrat et al., 2005, p. 2). Weighting career path changes of individuals from school to school highlighted the differences in job levels and promotions. Clauset, Arbesman & Larremore (2015) did not weight the edges indicating the path of professors from their doctoral degree to their first professorship position because each individual moved from the same level of degree program to their first teaching position. This research is focused on the entire career path of athletic directors, not just their first job in college athletics.

Clauset et al. (2015) created academic hierarchy networks to show the effects of social capital of universities on professorship job placement. They used directional edges to show the flow from the university at which professors received their doctoral degree to the university where they earned a position after receiving their doctorate. These directional connections in a network analyzing career paths in college athletics would show a logical flow from school to school, similar to the job path of professors.

3.2 BUILDING THE NETWORK

The population was comprised of the 65 athletic directors from the Power Five conferences: the ACC, Big Ten, Big XII, Pac-12 and SEC, as well as Notre Dame AD Jack Swarbrick. Athletic directors were noted as of September 1, 2019. The career paths of each athletic director were recorded using current bios on university athletics' websites, as well as using bios from past employers to check for accuracy or for more details. Any missing

information was cross referenced with career path information from the Collegiate Sport Associates database – no sensitive or confidential information was used. When there were gaps in an AD's career biography on the athletics website and it could not be cross-referenced, they were moved into the "gap" bucket. Jobs at non-Division I schools were categorized into more generalized groups: DII, DIII, professional sports, non-sports positions, conference level, and national governing body, with the exception of Ottawa University (NAIA), which was kept as its own unique vertex because it didn't fit into any other larger groups.

Each university or organization that existed as a career stop for an athletic director was represented by a vertex *i*, and each change in position for an athletic director was represented by a directional edge from vertex *i* to vertex *j*. The directional edge $w_{i,j}$ was weighted using the algorithm

$$w_{i,j} = a(1.5) + b(1.5^2) + c(1.5^3) + d(1.5^4) + e(1.5^5); \text{ where}$$

a = total number of career moves to level a from institution i to institution j;
b = total number of career moves to level b from institution i to institution j;
c = total number of career moves to level c from institution i to institution j;
d = total number of career moves to level d from institution i to institution j;
e = total number of career moves to level e from institution i to institution j.

Levels of positions at a university were separated according to generalized job title. Level *a* denotes an internship, graduate assistant position, or entry level position; level *b* denotes a mid-level position; level *c* denotes an associate athletic director; level *d* denotes a senior associate or deputy athletic director; and level *e* denotes an athletic director. Parallel job movements held the same weight for the directed edge from vertex *i* to vertex *j*. Given the interconnectedness of college athletics, former student-athletes received an additional weight of 0.5 for their first position, regardless of level. For example, if a student-athlete's first career move was from a

bachelor's degree to an entry level position, the weight from vertex *i* to vertex *j* would be $w_{i,j} = (1+0.5) *(1.5)$.

Sensitivity analysis was done on the model to check for stability of the weights. The analysis showed an average of a one percent change in the value (*SD* = 0.1) and order (SD = 0.151) of PageRanks for the vertices in the network with a 0.25 decrease in the base of the exponent, and an average of a less than one percent change in the value (*SD* = 0.065) and order (*SD* = 0.097) of PageRanks for the vertices in the network with a 0.25 increase in the base.

Some positions outside of athletic administrative roles, such as assistant coaches, head coaches, professors, and lawyers, were weighted to comparable athletic administrative roles. Internships, advanced degrees, positions coaches, and moves into a professional athlete role were examples of entry level positions. Assistant athletic directors, accountants, assistant coaches, and lawyers were all categorized as mid-level positions. Some director roles and academic deans were grouped with associate ADs. Head coaches and vice presidents were grouped with senior associate ADs. Lastly, presidents, owners and general managers were grouped with ADs.

After data collection, there were 145 different institutions that ADs worked at through their careers. The resulting 145x145 matrix was not an adjacency matrix because some ADs were promoted within the same institution, meaning the diagonal was not completely comprised of zeros. After creating the matrix, the data was imported into Gephi 0.9.2, a network visualization software, to build the networks. The two layouts used for the visualizations were ForceAtlas2 and Circular. All metrics were computed using the statistics tool within Gephi. The networks had directed, weighted edges between vertices. Promotions within the same institution, or internal hires, created cyclical edges. These cyclical edges were not accounted for in the raw

in, out, and total degree counts, but were included in the weighted degree calculations. Therefore, cyclical edges had an effect on the authority, hub and PageRank calculations.

The network of connections between undergraduate institution and the institution at which they currently hold an AD position was built without using weighted edges. The edges were directed, and the weight was calculated by a distinct count of moves from the origin institution to the destination.

CHAPTER 4: RESULTS

4.1 CURRENT ATHLETIC DIRECTOR CAREER PATHS

Of the 65 current Power Five ADs, 42 were former student-athletes. Examining alumni association, 24 ADs held a position in the same conference as their undergraduate institution, while 18 were at their alma mater. Although not in the same conference, 18 ADs were alumni of other Power Five institutions. There were 23 ADs who attended a non-Power Five institution for their undergraduate career, including 10 who received their bachelor's degree from a Division II institution, and five from a Division III (Table 1, Figure 1). There were 31 (48%) ADs who obtained their master's degree, and 10 (15%) who earned a law degree.

The shortest career paths were those of John Wildhack (Syracuse) and Vince Tyra (Louisville), where they had only made two career moves to land at their third, and current, position. The longest career path was Jeff Long's (Kansas), where it took 14 moves to reach his current position. On average, ADs made 8.83 career stops (SD = 2.66). The median number of stops for their current AD position was nine. The average (10.75, SD = 1.3) and median (11) of total positions for female ADs were higher than that of their male counterparts. Throughout all of the Power Five ADs, there were 12 total stops at Division II's, 14 at Division III's, 15 in non-sports positions, and 23 in professional sports positions, including six as professional athletes.

Looking at job positions overall, there were at least 18 ADs who held a position in development (28%), and five in academia as a professor, dean or academic administrator (8%). There were 13 ADs who coached at some point during their careers (20%), 13 who were

involved in professional sports (20%), and 49 who held a position as an assistant, associate, senior associate and/or deputy AD position (75%).

4.2 NETWORK CHARACTERISTICS

The complete matrix was 145x145. There were 145 vertices in the network, and 360 directed edges (Figure 2). There were 10 distinct communities and 28 strongly connected components. The diameter of the network was 11, with an average path length of 4.62. The average total degree of the vertices was 4.97 (*SD* = 4.24) (Table 2).

The three institutions with the largest weighted in degree were professional sports (84.43), Notre Dame (69.04), and Tennessee (61.65); the three institutions with the largest weighted out degree were Notre Dame (94.47), professional sports (92.86), and Tennessee (73.8); and the three institutions with the largest total weighted degree were professional sports (177.29), Notre Dame (163.5), and Tennessee (135.45) (Table 3). The three institutions with the highest betweenness centrality were professional sports (x_i = 3801.78), non-sports positions (x_i = 3266.4), and Notre Dame (x_i = 3167.62). The three largest authorities in the network were professional sports (0.475), Miami (FL) (0.333), and Florida State (0.267). The three largest hubs were non-sports positions (0.478), Notre Dame (0.418), and professional sports (0.328). The three institutions with the highest PageRank values were Kentucky (0.0262), professional sports (0.0208), and Georgia Tech (0.0189). Professional sports (0.475), Miami (0.333) and Florida State (0.267) had the highest authority values. The three largest hubs were non-sports positions (0.478), Notre Dame (0.418), and professional sports (0.328). The schools with the highest PageRank value within their respective communities, or most influential within their communities, can be found in Table 4.

There were 10 communities in the network. The average number of vertices in each community was 15 (*SD* = 6.3), and the median was 14. The largest community, modularity class 3 (MC3), was comprised of 26 vertices. The smallest community, MC5, had five vertices. Tables 5 and 6 show the Power Five institutions in each community, along with larger non-Division I institutions.

CHAPTER 5: DISCUSSION

5.1 CURRENT ATHLETIC DIRECTOR CAREER PATHS

The purpose of this research was to build and analyze networks based on the work history of current power five athletic directors, in order to identify patterns in career paths and hiring patterns of the institutions. The data consisted of the 145 institutions where each of the 65 Power Five ADs have studied or worked, along with the levels of positions they held at each institution. Each position was categorized into one of five levels, and former student athletes received an incremental bonus on their first career move from their undergraduate institution.

The initial results for the demographics of the ADs showed that 65% were former student-athletes. The conference with the lowest percentage of former student-athletes was the ACC. The decrease in the amount of former student athletes in AD roles could be a reflection of the shift in intercollegiate athletics towards a more business-minded industry in order to generate the revenue that is required to support programs (Hardin, et al., 2013). For context, the five highest department revenues in the NCAA in 2016-2017 ranged from $174.3 million to $214.8 million, with the highest expense budget at $207 million (Osborne, Jensen & Weight, 2020).

Compared to previous research done by Hardin et al. (2013), the number of ADs with professional degrees had decreased, but the number of ADs who held doctorates has increased slightly since the research done by Lumpkin et al. (2015). Holding a position in academia wasn't prevalent, which could infer a continued separation between academics and intercollegiate

athletics. There was a 9% increase from the study done by Hardin et al. (2013) for ADs having athletic administrative experience.

As it was suggested in previous research, over a quarter of ADs have held development positions, reinforcing the importance of having experience with fundraising and revenue generation. One fifth of ADs had experience in professional sports, and if this number continues to increase, it could support the idea that college sports are shifting towards a professional sports orientation. The length of careers for John Wildhack, Vince Tyra and Malcolm Turner were all short, and all of their professional experience was in the professional sports industry. Vince Tyra was the only former student-athlete of the three. Although there are some former coaches that never held administrative positions within the department, the three aforementioned ADs had no post graduate experience working not just in an athletic department, but on a college campus in general. The possible exception to this would be Turner who earned his law degree from Harvard.

There were four female Power Five ADs: Carla Williams (Virginia), Heather Lyke (Pittsburgh), Sandy Barbour (Penn State), and Jennifer Cohen (Washington). All four held one or more professional degrees, and three were student-athletes at Power Five schools. With the exception of Barbour, the schools they worked at were regional. Cohen spent the beginning of her career at two Division III schools, Pacific Lutheran and University of Puget Sound, before moving up to Texas Tech, and then onto Washington. Lyke was the only one to move from a position at a non-Power Five to an AD position at a Power Five. Similar to the research done by Taylor and Hardin (2016), the female ADs were predominantly former student-athletes and obtained a professional degree. These four women seem as qualified, if not more, to assume the

same positions as the men, but it takes them longer to reach their final destinations. Plainly stated, they have a more difficult path to get to the same place as male ADs.

For every conference, at least two ADs worked at their alma maters, and between 30-50% were alumni of their current conference. In contrast, between 29-40% of ADs in every conference received their undergraduate education from a non-Power Five school. In the Big 10, Big XII and Pac-12, the majority of the ADs received their bachelor's degree from a non-Power Five institution. The ACC and SEC ADs tended to be alumni of their conference. There was not a conference in which there was a higher percentage of ADs from other Power Five institutions than non-Power Fives (Table 1, Figure 1). From these findings, it appears to be beneficial to either graduate from a school within the conference, or from a non-Power Five.

In summary, ADs predominantly were either alumni of the conference or received their bachelor's from a non-Power Five school. The path to becoming a Power Five AD appears to lie within the athletic administration track, while gaining experience in professional sports or revenue generation. Female ADs have had more career stops than men, and it was more prevalent for female ADs to have a professional degree and be a former student athlete.

5.2 NETWORK CHARACTERISTICS

The first observation for the complete hiring network (Figure 2) is that it was comprised of one connected component, meaning that one could start at any vertex in the network and be able to walk to any other vertex along the edges. On the other hand, the network produced by mapping the ADs' undergraduate institutions directly to their current institution is not connected – there are separate components (Figure 3). The diameter of the network describes the furthest distance between any two vertices, and the diameter for the hiring network was 11. On average, the shortest path between any two vertices was 4.62. In other words, the least amount of career

moves between any two institutions in the network was, on average, between four and five. If an AD was at school A, and they wanted to get a job at any other school in the network, it would take them, on average, at least four career moves.

The unweighted degree measures were a raw count of career moves, whereas the weighted degree measures were qualitative, taking into consideration the value of the career move along with student athlete status. In-degree denoted the hiring of an AD during their career, and the out-degree denoted the AD leaving for another job. Internal hires were represented by cyclical edges. Cyclical edges, or hires within the same institution, were not included in the edge count when calculating the total, not weighted, degree, and thus measures the number of transitions between institutions. Meanwhile, these cyclical edges are used in the calculations for weighted degree, Hub and Authority Scores and for PageRank. These cyclical edges play an important role in the "feedback loops" in the recursive definitions of these measures. As far as movement through the institutions, the average number of ADs who were hired by the institution and left for another job was 4.97 (Table 2).

Looking at Table 3, these institutions had the highest cumulative weights of careers moves through them. Professional sports had the most career moves through it, and it also had the highest total weighted degree. Vertices like Georgia, Tennessee and Miami who had fewer total degrees, and higher total weighted degrees – relative to other institutions – signified that the changes in job positions had greater weights than the others. This was interpreted as ADs either coming in at high ranking positions, leaving at high ranking positions, or both. It is important to note that cyclical edges, meaning ADs were promoted within the same institution, were not recorded in the count of in and out degrees. For example, there were five promotions within

Miami, although the in degree only shows eight hires. That means that it only counted outside hires. This was a limitation in the interpretation of non-weighted and weighted degrees.

Isolating just the movement from undergraduate to current institutions, Notre Dame was the most prevalent undergraduate alma mater amongst current ADs with six alumni (Figure 3). DII and DIII institutions were the second most productive with five alumni each. With this visualization, it was more clear which ADs stayed at their alma mater; it's a visual representation of Table 1. The concept of regionality was shown in this figure as well, with 34 of the 65 moves happening within similar geographic regions. For example, two alumni from Notre Dame are at Ohio State (Gene Smith), and Purdue (Mike Bobinski), while Jack Swarbrick is back at Notre Dame. Other examples were Gary Barta, who graduated from North Dakota State and is the AD at Iowa; Mark Coyle graduated from Drake in Iowa and is the AD at Minnesota. Being hired within the same region as their undergraduate institution was common amongst over half of the current Power Five ADs. Connections between schools within the same region could have played a part in their careers, even years after leaving their undergraduate institutions.

Communities of institutions are where there are dense connections, or more clustering, within those groups (Table 6, Figure 2). The communities of Power Five schools were not necessarily related to geographic location or conference affiliation. Keeping DIIs and DIIIs together could have hidden some geographic connections between those and Division I institutions, but keeping them together showed the collective power of working in those divisions. Although they were not geographic or more conference-aligned, the communities still showed common flow between institutions. Some communities were smaller, because only one or two ADs moved through those particular schools.

Betweenness centrality measured who the "middle men" in the network were, or in terms of career paths, places that ADs worked at most commonly in the middle of their careers. Professional sports had the highest betweenness centrality in the network, and the average career stop in professional sports was 4.75 (*SD* = 2.6). Looking back at the average number of career stops, which was close to nine, having a job in professional sports as their fifth position made sense. The second and third highest betweenness centralities were in non-sports positions and at Notre Dame, respectively. Betweenness centrality could help younger, aspiring athletic directors decide where they should try to get jobs towards the middle of their careers, if they want to be an AD at a Power Five.

The next five institutions with the highest betweenness centrality were Kentucky, Miami, Georgia Tech, Division II and Division III schools. Half of the top eight were Power Five universities, so by their fifth jobs, ADs were working at Power Fives. If they were at Division II or Division III institutions, ADs were generally either completing their degrees at that institution or were the athletic director. Again, this reinforces the pattern that ADs were working at Power Fives by the middle of their careers, or they held high positions at DIIs or DIIIs.

Authorities in the network are institutions that ADs go to at higher position levels from hubs. The five institutions with the highest authority scores were professional sports, Miami, Florida State, Notre Dame and DIII. In professional sports, there were 12 hires at the senior associate or AD level. Eight of those hires came from within professional sports, not necessarily within the same organization, but it's important to note that the distinct in degree count does not reflect those hires within the same industry or school. At Miami, there were three hires at the associate AD level, two hires at senior associate AD, and two at the AD level, out of 13 total hires. Out of the 19 hires at Notre Dame, 12 of them were at the Associate AD level or above. In

DIII, there were nine hires, four of which were as an AD (Jim Knowlton, Kevin White, and Josh Whitman twice), and three that were for a professional degree. Two hires, which were from Cohen's (Washington) career path, were unknown.

In professional sports, it is logical to presume that hires happened at higher, executive role positions, because those are the professionals who move into AD roles. If it is common to be in that role before becoming an AD, then ADs are going to stay in that industry until they reach those levels. Other interesting observations are the results from Notre Dame and DIII. Of the seven outside hires at Notre Dame, six were at the associate AD level or higher – only one outside hire was at an entry level position. Four internal hires were at entry level positions. At the DIII level, ADs seemed to only go there if they were going to be an AD. Not to say that having a position at a DIII early on or in the middle of their careers would not have been beneficial, but they did not have positions there unless it was for a degree or as an AD. The three that were ADs were then hired as ADs at Air Force, Maine, Illinois and another DIII institution.

Hubs in the network were institutions where ADs left for high level positions at authorities. These institutions could be considered spring boards for ADs. The institutions with the five highest hub scores were non-sports positions, Notre Dame, professional sports, Georgia and Miami. Coming out of jobs at non-sports organizations, six landed at AD level positions – two of which were AD jobs at Power Five schools (Vince Tyra and Jack Swarbrick). After working at Notre Dame, five ADs went on to hold that position at Division I schools, including at two Power Fives (Kevin White and Sandy Barbour). In total, there were 14 jobs that ADs moved on to that were at the associate AD level or higher. Four ADs were hired as ADs at Power Fives after working in professional sports (Fred Glass, Ray Anderson, Rick George and Malcolm Turner), and seven more were hired in senior associate AD level positions. From Georgia, two

were hired as ADs at Power Fives (Carla Williams and Damon Evans, promoted internally), and six were hired at the senior associate AD level. Miami sent Kirby Hocutt, Blake James (promoted internally as interim and permanent) on to jobs as ADs at Power Five schools, and four on to senior associate AD level jobs.

At least two ADs from each of the hubs went on to hold AD or AD level jobs as their next position. In the case of Miami, Blake James was promoted to interim AD and then was hired officially as the AD. Kirby Hocutt was hired as the AD at Texas Tech after working at Miami. No one was promoted from within Notre Dame into the AD position, but at Georgia, Damon Evans was hired as the AD after serving as a senior associate AD there.

After the analysis, these five institutions were the most effective at getting ADs high level jobs for their next step. That was made apparent by the kinds of career moves the ADs were able to make. Professional sports and non-sports positions were places where ADs found a great amount of success afterwards. If people left for AD jobs in college sports after working in the professional realm, they all left for Power Five AD positions. There is a shift in college sports to hiring from professional sports, and deducing from the data, it was an effective path to reach that goal.

PageRank indicated who the greatest influencers in the network were. If institutions were hiring from other influential institutions, and sending ADs onto jobs at other influential institutions, it increased their PageRank value. Within the network, Kentucky had the highest PageRank. This was surprising, but after further observation, the reason why became clear. Kentucky was efficient and productive. Not many people went through Kentucky, but when they did, they came in at high level jobs, and left for high level jobs. Of the seven that were hired by Kentucky, two were hired as associate ADs (Greg Byrne, Scott Stricklin), one was hired as a

head coach (John Cohen), one as an executive associate AD (Rob Mullens), two were hired as deputy ADs (Mark Coyle, Rob Mullens), and the last, Mitch Barnhart, was hired as the AD. People who came in for jobs at Kentucky only came in from other Power Five schools, with five out of seven coming from jobs as associate ADs or higher.

When people left Kentucky, they found similar success. Only one, Vince Tyra, left for a mid-level job, and that was after graduating with their bachelor's from Kentucky. Of the six other people that left, five went on to work at other Power Fives. Mark Coyle, who left for a non-Power Five school, took a job as the AD at Boise State. He is currently the AD at Minnesota. Otherwise, ADs left for jobs as an associate AD (Greg Byrne), a head coach (John Cohen), a senior associate AD (Scott Stricklin), a deputy AD (Rob Mullens, promoted within Kentucky), and a Power Five AD (Rob Mullens to Oregon).

Non-sports positions and professional sports were not as surprising because although there was a high volume of ADs moving through, many went on to high level positions at influential schools. Coming out of Georgia Tech, Dan Radakovich and Mike Bobinski left for AD positions at Power Fives, and the others that left (Todd Stansbury and Warde Manuel) went on to work in either professional sports or at Power Five schools. Three of the seven hired by Georgia Tech came in as the AD, and five out of the seven came in from Power Fives. Although Georgia Tech did not seem to be as prolific as, say, Notre Dame, they were well connected to other influencers, and had high value hires, while sending off two people to be Power Five ADs.

Oregon State was another school that did not have as much movement, but was influential nonetheless. When people came in to Oregon State, Greg Byrne was hired as an associate AD, Todd Stansbury as an executive associate AD, and three (Mitch Barnhart, Todd Stansbury, Scott Barnes) were hired as the AD. They came from East Tennessee State, Oregon,

Pitt, Tennessee and UCF. When individuals left Oregon State, three left for AD positions – Todd Stansbury to UCF and Georgia Tech, and Mitch Barnhart to Kentucky – and Greg Byrne left to be an associate AD at Kentucky. Similar to Kentucky, Oregon State hired the ADs at high level positions – three out of five from Power Fives – and propelled them on to work in high level positions at influential schools.

What made these five institutions influential over other schools, like Notre Dame, was the level of job that ADs came in at and left for, as well as who else in the network they were well connected to. Oregon State sent two people to be ADs at institutions that were also in the top five for PageRank. Georgia Tech followed a similar pattern, as did Kentucky. Non-sports and professional sports organizations had more movement through them, but again, had prestigious job placement and hires.

LSU had the sixth highest PageRank, and was just higher than Notre Dame. Of the three people that moved on from LSU, Scott Woodward was promoted internally to a mid-level position at LSU and then left for a job as a vice president at Washington, and Dan Radakovich went on to be the AD at Georgia Tech. LSU hired Scott Woodward from within at the mid-level job, Dan Radakovich from American coming in as a senior associate AD, and then hired their current AD, Scott Woodward, from Texas A&M. Notre Dame fell right below LSU in PageRank because of the small, but high value moves through Baton Rouge. Notre Dame, in all respects, was still one of the most influential institutions in the network.

The network valued not only the weight of the job, but where the job was. There is value in universities like Kentucky, Georgia Tech, Oregon State and LSU, as well as Notre Dame, and professional and non-sports organizations. The first group of schools had low movement, but impactful movement. The higher traffic through the other group was also impactful, but also had

more entry level and mid-level positions. It is also important to know where the current ADs went early on in their careers, because presumably, that helped set them up later on. For example, Notre Dame had six ADs graduate with their bachelor's degree, which was the most in the network. That adds to their influence even if the graduates are only moving on to entry level positions.

Different metrics show different roles that institutions play within the hierarchy. Betweenness centrality shows where ADs generally stop in the middle of their careers. Authorities hire ADs at high level positions, hubs excel at helping ADs get hired at high level positions, and institutions with high PageRank values are excellent at doing both, while also being connected to other influencers.

5.3 CONCLUSION

The backgrounds of ADs have changed, with less having professional degrees, as well as a decreased percentage of former student athletes. Female ADs tended to have more career stops, on average, as well as a higher percentage being student athletes and holding a professional degree. Given their qualifications and longer career paths, it seems that female ADs had harder career paths than their male counterparts. In connection with their current positions, ADs tended to either work at their alma mater, or graduated from a non-Division I school.

The flow of ADs through professional sports and non-sports organizations also supported the shift in culture in intercollegiate athletics towards that of a more professional sports orientation. Notre Dame, professional sports and non-sports organizations were consistently ranked at the top as authorities, hubs, and influencers in the network. They also had the highest betweenness centralities, signifying that they were, on average, a stop for ADs during the middle of their careers. Other influencers like Kentucky, Georgia Tech, Oregon State and LSU had less

movement through them, but had high value connections with other influential schools. DII and DIII schools were the most influential in their communities, and had movement through them generally as an undergraduate institution, or as a stop as an AD before moving on to be an AD in a higher division. The most powerful influencers in the network were professional sports and non-sports organizations, and Power Five institutions.

Each metric can be used to infer different hiring characteristics for the institutions. Authorities are institutions that hire ADs at high level positions; hubs are institutions that propel ADs into high level positions; and institutions with high PageRank values are efficient in hiring ADs and sending them off to high level jobs, as well as being connected to influential institutions within the network.

5.4 FUTURE RESEARCH

Future research could examine the racial and further gendered breakdowns of the Power Five ADs. The reach of the sample could also be extended to include all FBS, FCS, DII or DIII schools. If possible, interviewing the ADs could help with the reliability of the information on their career paths as this was a limitation to this study. Influential ADs that were at institutions previously might not be reflected in this study. Therefore, it can be extended to include past ADs as well.

TABLES & FIGURES

Table 1: Alumni Connections by Conference

Conference	University Alumni	Conference Alumni	Other Power 5 Alumni	Non-Power 5 Alumni	Former Student Athletes
ACC	5 (36%)	7 (50%)	3 (21%)	4 (29%)	8 (57%)
Big 10	4 (27%)	4 (27%)	5 (33%)	6 (40%)	10 (67%)
Big XII	2 (20%)	3 (30%)	3 (30%)	4 (40%)	7 (70%)
Pac-12	2 (17%)	4 (33%)	3 (25%)	5 (42%)	8 (75%)
SEC	5 (36%)	6 (43%)	4 (29%)	4 (29%)	9 (64%)

Table 2: Descriptive Metrics for the Network

Total Vertices	Total Edges	Diameter	Average Path Length	Average Total Degree	Modularity	Communities (Mod. Classes)
145	360	11	4.62	4.97	0.58	10

Table 3: Top 10 Institutions by Total Weighted Degree

Institution	In Degree	Out Degree	Total Degree	Weighted In Degree	Weighted Out Degree	Total Weighted Degree
Pro Sports	11	11	22	84.4	92.9	177.3
Notre Dame	8	12	20	69.0	94.5	163.5
Tennessee	6	6	12	61.6	73.8	135.4
Georgia	4	6	10	53.9	59.3	113.2
Non-Sports	9	11	20	37.4	73.7	111.1
Miami	8	8	16	54.4	55.4	109.8
Washington	5	4	9	47.5	52.9	100.4
Missouri	8	7	15	44.9	51.2	96.1
Ohio State	6	5	11	46.0	49.7	95.6
Arizona	5	7	12	43.6	44.3	88.0

Table 4: Top 10 Institutions by PageRank

Institution	PageRank	Weighted In Degree	Weighted Out Degree	Total Weighted Degree	Authority Score	Hub Score	Mod. Class
Kentucky	0.0262	34.59	30.9	65.5	0.024	0.064	6
Pro Sports	0.0208	84.43	92.9	177.3	0.475	0.328	9
GA Tech	0.0189	31.78	27.1	58.9	0.153	0.132	8
Oregon State	0.0183	31.22	26.2	57.4	0.034	0.042	8
Non-Sports	0.0178	37.37	73.7	111.1	0.182	0.478	9
LSU	0.0172	14.91	14.9	29.8	0.000	0.038	8
Notre Dame	0.0171	69.04	94.5	163.5	0.249	0.418	4
AZ State	0.0158	31.78	27.9	59.7	0.168	0.117	4
Tulane	0.0158	27.56	21.8	49.4	0.048	0.168	4
Tennessee	0.0156	61.65	73.8	135.4	0.070	0.087	8

Table 5: Top Five Institutions in Authority Score, Hub Score and PageRank

	Authorities	Hubs	PageRank
1	Professional Sports	Non-Sports Positions	Kentucky
2	Miami	Notre Dame	Professional Sports
3	Florida State	Professional Sports	Georgia Tech
4	Notre Dame	Georgia	Oregon State
5	DIII	Miami	Non-Sports Positions

Table 6: Heads of Communities by PageRank

Modularity Class (MC)	Institution	PageRank	Authority Score	Hub Score	Total Weighted Degree
0	Oregon	0.0148	0.072	0.037	52.1
1	DIII	0.0107	0.182	0.124	69.4
2	DII	0.0113	0.051	0.156	67.2
3	Missouri	0.0149	0.125	0.136	96.1
4	Notre Dame	0.0171	0.249	0.418	163.5
5	North Carolina	0.0067	0.029	0.051	15.0
6	Kentucky	0.0262	0.024	0.064	65.5
7	Michigan	0.0084	0.047	0.085	46.2
8	Georgia Tech	0.0189	0.153	0.132	58.9
9	Pro Sports	0.0208	0.475	0.328	177.3

Table 7: Communities Excluding Non-Power Five DI Institutions

Institution	Community	Institution	Community
Oregon	MC 0	Stanford	MC 4
Arizona	MC 0	Wisconsin	MC 4
Washington State	MC 0	UNC	MC 5
WVU	MC 0	Rutgers	MC 5
Conference Level	MC 0	Kentucky	MC 6
Alabama	MC 0	Syracuse	MC 6
Texas	MC 0	Georgia	MC 6
TCU	MC 0	Florida	MC 6
Nebraska	MC 0	Minnesota	MC 6
DIII	MC 1	Mississippi State	MC 6
Penn State	MC 1	Virginia	MC 6
Cal	MC 1	Michigan	MC 7
Illinois	MC 1	Oklahoma State	MC 7
Colorado	MC 1	Auburn	MC 7
DII	MC 2	Virginia Tech	MC 7
UCLA	MC 2	Georgia Tech	MC 8
Ole Miss	MC 2	Oregon State	MC 8
Utah	MC 2	LSU	MC 8
USC	MC 2	Tennessee	MC 8
Mizzou	MC 3	Washington	MC 8
Pitt	MC 3	Kansas State	MC 8
Ohio State	MC 3	Iowa	MC 8
Kansas	MC 3	Texas A&M	MC 8
Arkansas	MC 3	Wake Forest	MC 8
Nat’l Gov Body	MC 3	Clemson	MC 8
Baylor	MC 3	Purdue	MC 8
Boston College	MC 3	Pro Sports	MC 9
Michigan State	MC 3	Non-Sports	MC 9
Notre Dame	MC 4	Miami	MC 9
Arizona State	MC 4	Vanderbilt	MC 9
NC State	MC 4	Texas Tech	MC 9
South Carolina	MC 4	Maryland	MC 9
Iowa State	MC 4	Florida State	MC 9
Northwestern	MC 4	Indiana	MC 9
Duke	MC 4	Louisville	MC 9

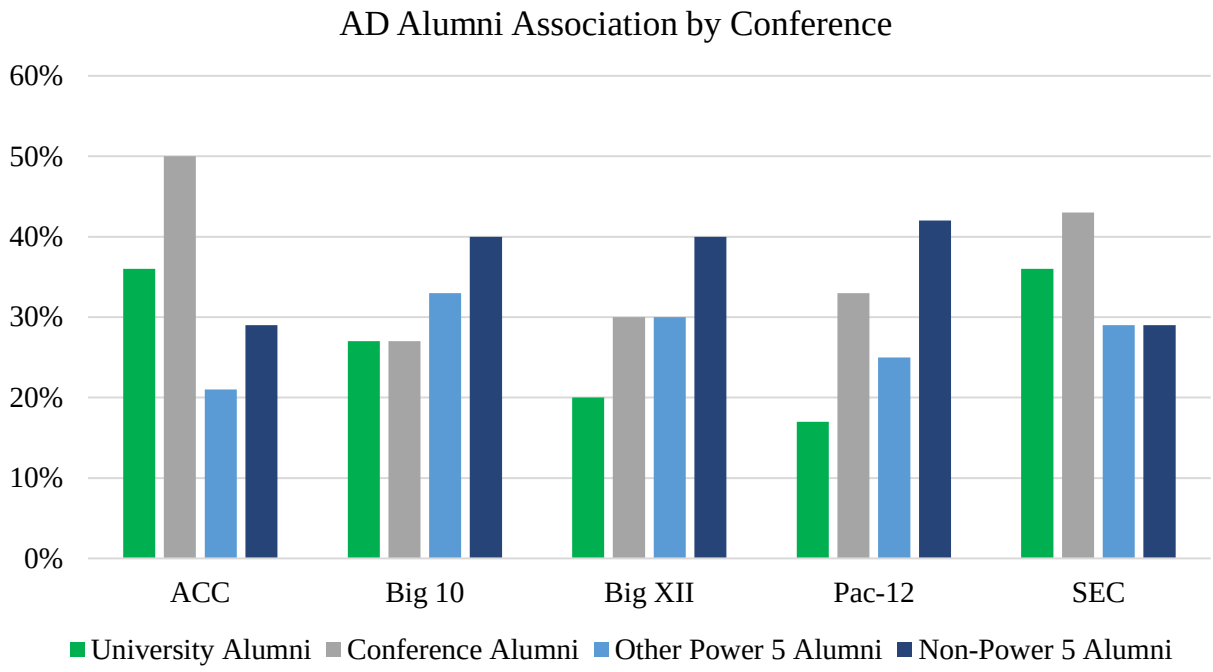

Figure 1: AD Alumni Association by Conference

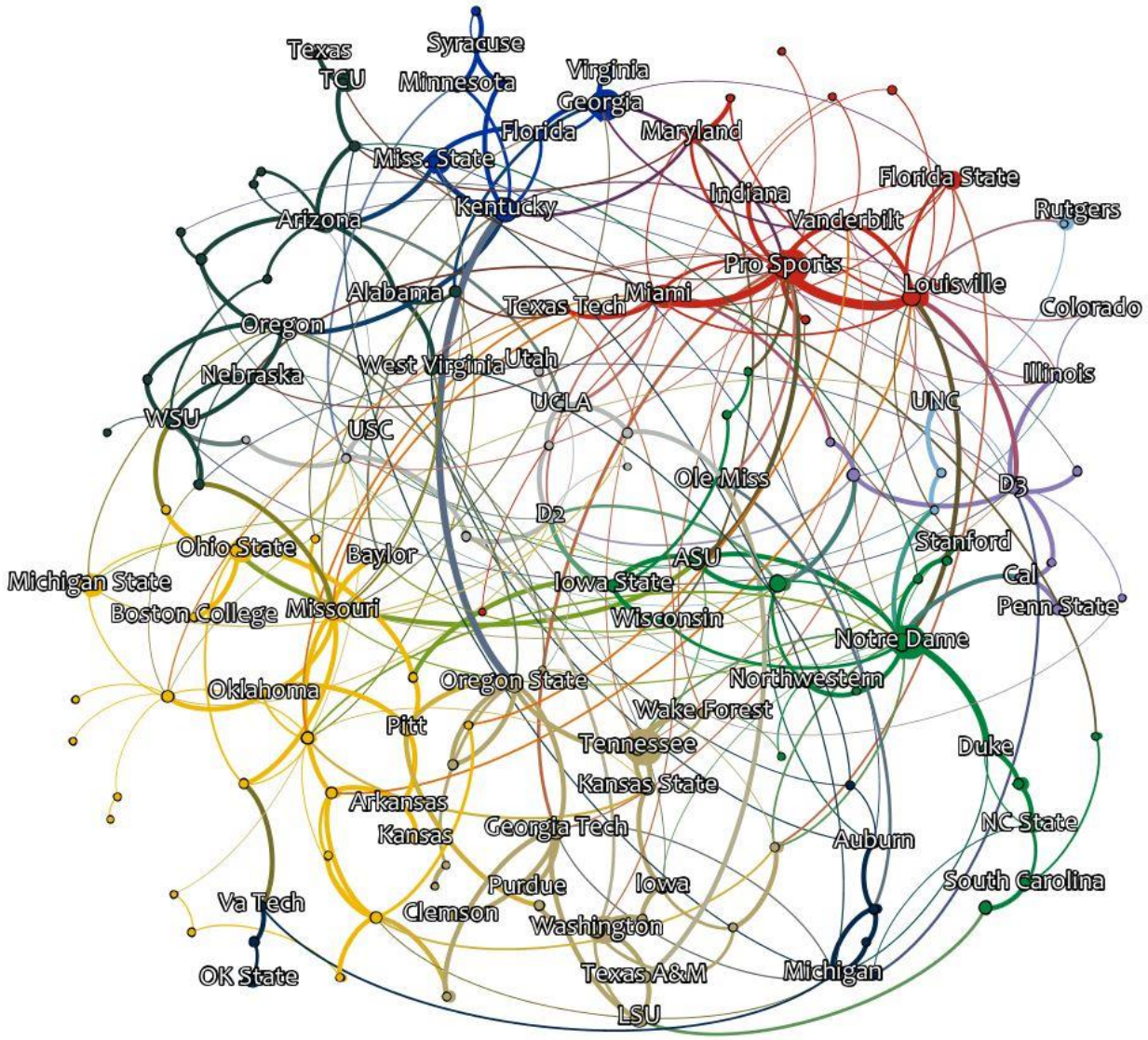

Figure 2: Hiring Network of Current Power Five ADs

Vertex size is proportional to its total weighted degree, and colors denote communities. Colors are representative of the institution with the highest PageRank in the community. Power Five schools, along with professional sports, DII, and DIII are labeled; all others are not.

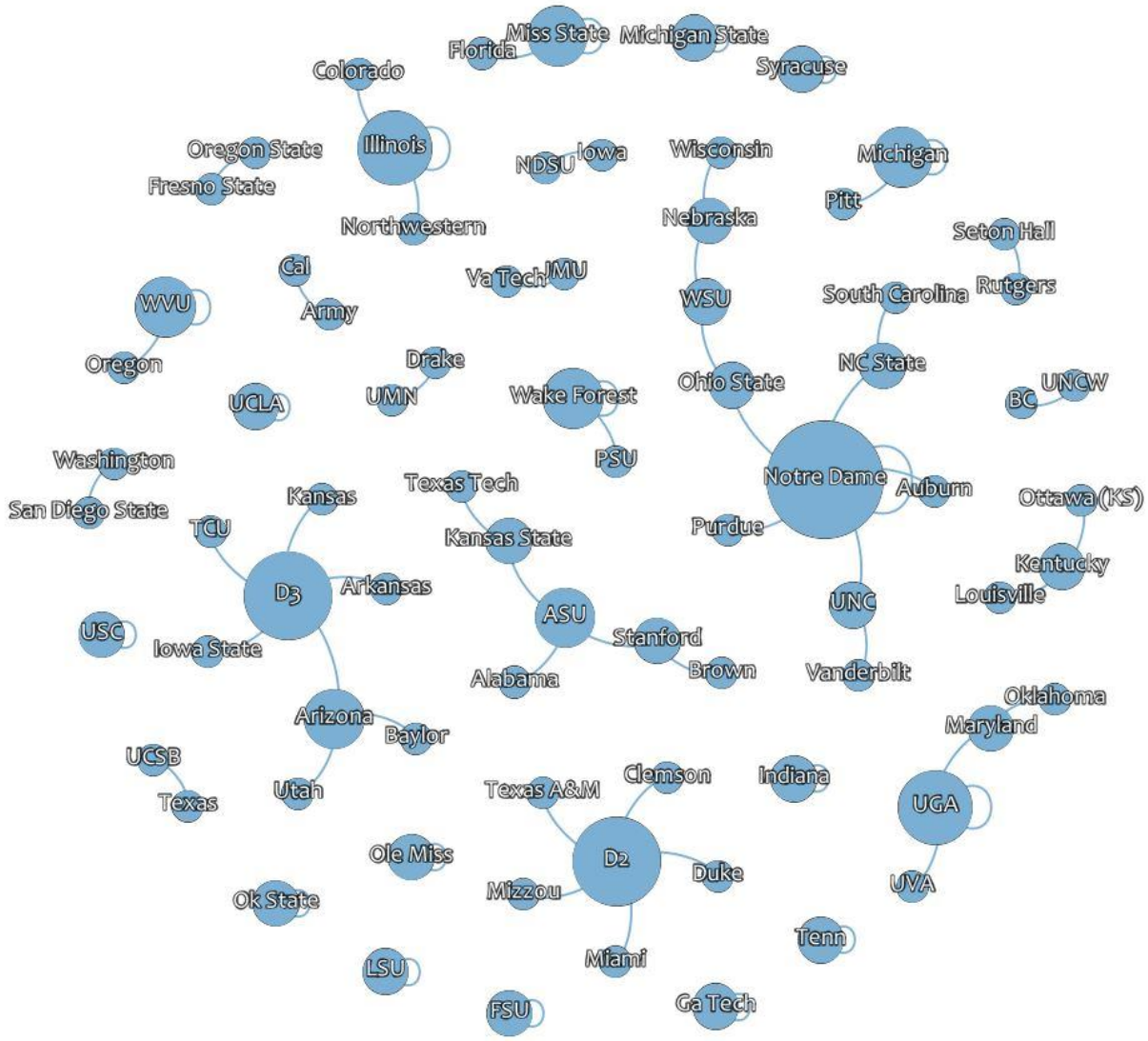

Figure 3: Undergraduate and Current Position Network of Power Five ADs

The graph shows connections between the undergraduate institutions of the Power Five ADs and their current institution. The size of the vertex represents the vertex's total degree.

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